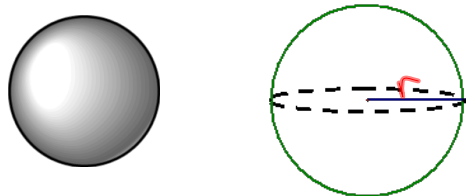


12.6 Surface Area and Volume of Spheres

Sphere-The set of all points in space that are a given distance (radius) to a given point (center).



$$A = 4\pi r^2$$

Ex:

$$r = 4\text{cm}$$

$$V = \frac{4}{3} \pi r^3$$

$$A = 4\pi(4)^2$$

$$A = 64\pi \text{ cm}^2$$

$$V = \frac{4}{3} \pi 4^3$$

$$= 85\frac{1}{3} \pi \text{ cm}^3$$

Ex:

$$V = \frac{32000\pi}{3} \text{ cm}^3$$

$$A = 4\pi(20)^2 = 1600\pi \text{ cm}^2$$

$$\frac{32000\pi}{3} = \frac{4}{3} \pi r^3$$

$$32000 = 4r^3 \quad 20 = r$$

$$8000 = r^3$$

Ex:

$$A = 12\pi \text{ cm}^2$$

$$V = \frac{4}{3} \pi (\sqrt{3})^3 = \frac{4}{3} \pi 3\sqrt{3}$$

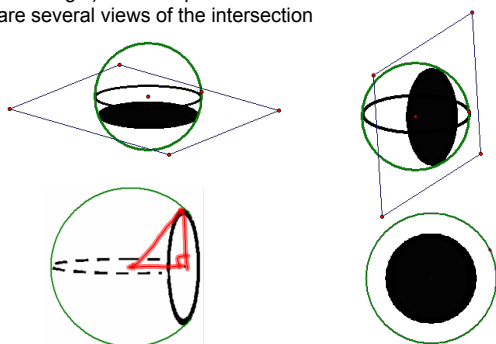
$$4\sqrt{3} \pi \text{ cm}^3$$

$$12\pi = 4\pi r^2$$

$$3 = r^2$$

$$\sqrt{3} = r$$

When a sphere and a plane intersect, the intersection is a circle. Try to imagine slicing an orange what two dimensional shape is left where you cut the slice-a circle. Also, imagine pouring water into sphere (but not filling it) what shape is the surface of the water-a circle. Shown are several views of the intersection



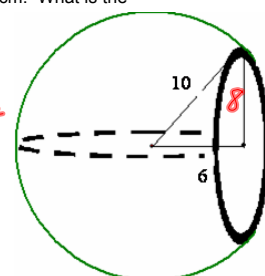
EX:

A plane intersects a sphere 6 cm from the center of the sphere. The radius of the sphere is 10cm. What is the area of the circle formed?

$$\text{Radius of the circle} = 8 \text{ cm}$$

(Pythagorean thm.)

$$\text{Area of the circle} = 64\pi \text{ cm}^2$$



EX:

A plane intersects a sphere 3 cm from the center of the sphere. The radius of the sphere is 8 cm. What is the area of the circle formed?

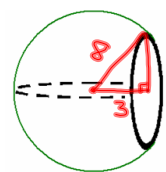
Radius of the circle = $\sqrt{55}$
(Pythagorean thm.)

Area of the circle = $55\pi \text{ cm}^2$

$$8^2 = 3^2 + r^2$$

$$55 = r^2$$

$$\sqrt{55} = r$$



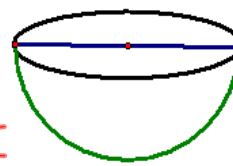
The great circle occurs when the slice is taken at the hemisphere.

$$A = 4\pi r^2$$

$$\frac{1}{2} = 2\pi r^2 + \pi r^2$$

$$16\pi = \pi r^2$$

$$4 = r$$



What is the SA of the hemisphere, if the area of the great circle is 16π ?

$$A_{\text{hem}} = 3\pi r^2$$

$$= 3 \cdot 16\pi$$

$$48\pi \text{ m}^2$$

$$V = \frac{2}{3}\pi r^3$$

HW

p842-844

#s 3, 4, 7, 10, 11, 17, 23, 33

FINDING SURFACE AREA Find the surface area of the sphere. Round your answer to two decimal places.

3.

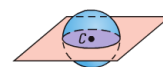


4.



USING A GREAT CIRCLE In Exercises 7–9, use the sphere below. The center of the sphere is C and its circumference is 9.6π inches.

7. Find the radius of the sphere.



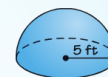
10. **ERROR ANALYSIS** Describe and correct the error in finding the surface area of a hemisphere with radius 5 feet.

$$S = 4\pi r^2$$

$$= 4\pi(5)^2$$

$$= 100\pi$$

$$\approx 314.16 \text{ ft}^2$$

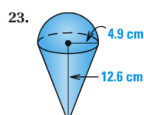


11. **GREAT CIRCLE** The circumference of a great circle of a sphere is 48.4π centimeters. What is the surface area of the sphere?

USING VOLUME In Exercises 16–18, find the radius of a sphere with the given volume V . Round your answers to two decimal places.

17. $V = 91.95 \text{ cm}^3$

COMPOSITE SOLIDS Find the surface area and the volume of the solid. The cylinders and cones are right. Round your answers to two decimal places.



33. ★ **SHORT RESPONSE** Tennis balls are stored in a cylindrical container with height 8.625 inches and radius 1.43 inches.

a. The circumference of a tennis ball is 8 inches. Find the volume of a tennis ball.

b. There are 3 tennis balls in the container. Find the amount of space within the cylinder not taken up by the tennis balls.

